

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
30 November 2000 (30.11.2000)

PCT

(10) International Publication Number
WO 00/72534 A1

- (51) International Patent Classification⁷: H04L 12/58, H04M 3/533
- (21) International Application Number: PCT/GB00/01962
- (22) International Filing Date: 22 May 2000 (22.05.2000)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
9911941.4 21 May 1999 (21.05.1999) GB
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- (81) Designated States (national): AE, AG, AL, AM, AT, AT (utility model), AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, CZ (utility model), DE, DE (utility model), DK, DK (utility model), DM, DZ, EE, EE (utility model), ES, FI, FI (utility model), GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KR (utility model), KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SK (utility model), SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.
- (84) Designated States (regional): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published:

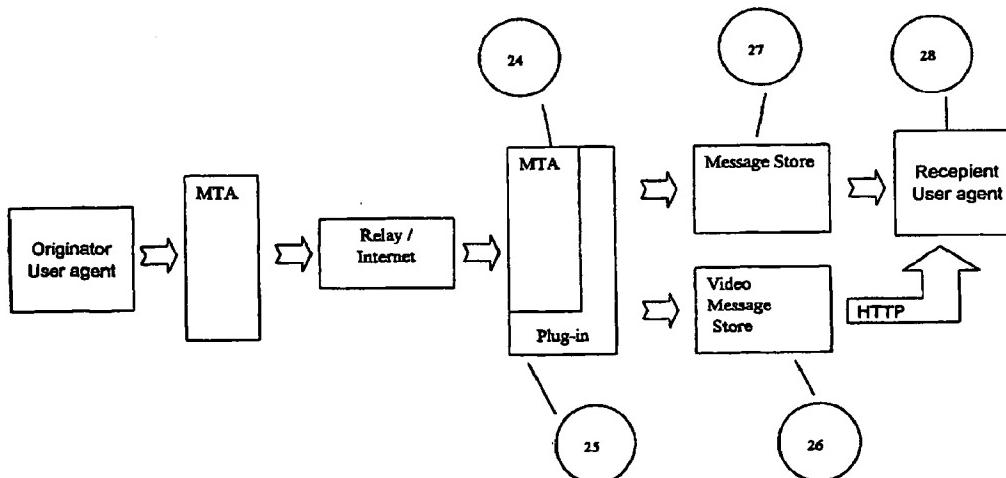
- With international search report.
- Before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments.

[Continued on next page]

(54) Title: ELECTRONIC MAIL SYSTEMS



WO 00/72534 A1



(57) Abstract: An electronic mail system comprises a mail transfer agent (24) which receives incoming mail and allocates the mail to a plurality of private message stores (27) where it is stored in e-mail format for access by individual recipients. The system further comprises a database (26) establishing a plurality of private attachment stores for access by individual recipients, and attachment processing means which scans incoming mail, detects attachments such as video files, and processes the attachments. An attachment is removed from the incoming item of mail and placed in the private attachment store for the recipient of the incoming mail item. In the mail message, the attachment is replaced by a link to the attachment in the private attachment store. The recipient of the mail message may access the attachment in the private attachment store by activating the link in the mail message.

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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

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Electronic Mail Systems

5 This invention relates to electronic mail systems and is particularly applicable to the handling of messages with large attachments such as images or video files.

10 Recent developments in combining computer and communications technology have enabled unskilled operators to transfer digital data between computer systems, irrespective of the location of each computer, using communications networks that are worldwide or global. Several types of data transfer are possible for 15 different applications. This invention is concerned with data transfers known generally as email, in which an originator may enter a message into a personal computer or workstation and send the message to any recipient or group of recipients anywhere in the world. The only 20 restriction is that the recipients must each have a computer or terminal connected to the communications network and each must have a unique personal identification, known as an email address.

25 The communications systems that are used to transmit the messages are hierarchical. The digital communications channel between an individual user's personal computer and, for example a computer which functions as a communications node on the network, may be a telephone line using a modem connection and capable 30 of transmitting only a few thousand bytes of information per second. The term User Agent is frequently used to describe the computer systems of the message originator and recipient. The communications node is often supplied by a service provider or mail transfer agent 35 (MTA). The MTA will usually be part of the hierarchical network, some parts of which may operate continuously at a few hundred megabytes per second. The relevant parts

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of the communications systems that are used to transmit data and the software application programs which are used to prepare, send, read and manage the email messages are briefly described later.

5 Because the computer systems which send and receive the email messages may differ widely in terms of performance and digital structure, it is necessary to limit basic email messages to digitally encoded characters which can be recognized by many types of 10 computer. The simplest type of message usually consists of basic text characters encoded by a computer system using a standard code set defined by the American National Standards Institution (ANSI) in specification X3.4 1986, as the American Standard Code for Information 15 Interchange (US-ASCII)

The growth and success of the global communications systems, particularly using Internet Official Protocol Standards developed by the Internet Engineering Task Force (IETF), and the wide use of personal computing 20 systems have resulted in email becoming an extremely powerful means of communication between two or more parties. IETF document RFC 822 describes the format of email messages. Many email systems have therefore been extended to allow data transmissions that represent 25 information that is more complex than a common character set. Such digitally encoded information may for example be an image or a video sequence of images, a document produced by a word processor or spread sheet program, or other data whose meaning is only understood by a 30 particular type of software application program.

So that compatibility with all computers is maintained, the more complex data is transmitted as data 35 that is included as additional data within the email message, but not necessarily understood by the computer programs and communication systems that handle the email messages. Such additional data, usually in the form of a data file known as an attachment, may be identified by

a description encoded in the universal US-ASCII code set. All computers in a network of computers can understand the description in US-ASCII code, but not necessarily the data content. Many data files such as
5 video files contain data that is byte oriented, that is any value 0 to 255 may occur in the data stream. Byte oriented data which is to be included in an attachment is re-encoded using the 7-bit US-ASCII character set or a printable subset of the 7-bit US-ASCII character set.
10 Various encoding methods are known and the type of encoding used is included as part of the attachment description. Base-64 is an example of a known method which encodes byte oriented data using only 64 of the available ASCII characters. In this method the video
15 data bytes are concatenated and then the resulting bit stream is divided into 6-bit blocks. Each 6-bit block is transmitted using a character from the ASCII character set. Thus each 8 bit byte sent in an attachment has one of only 64 possible values and every four bytes sent
20 contains only three bytes of video information. It will will be apparent that all encoding methods increase the number of bytes of data which is to be included in an attachment.

In currently known Internet systems, the attachment
25 description and data is known as a Multipurpose Internet Mail Extension, usually abbreviated to MIME. Various types of MIME are defined for transmitting data that represents text, images, audio, video or various combinations of these types. The MIME data describes
30 the encoding and meaning of the data and thus allows any format of binary data to be transmitted. A series of IETF documents, including RFC 2045 and 2046 define the MIME format in detail. In order to understand the attached data, the recipient user agent requires an
35 email application that can recognize the MIME type and an application that can utilize any received attached data.

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The file sizes that may be transmitted may be, for example, over 10 megabytes for a video sequence. A file of this length could take from 25 to 45 minutes to download via a telephone line using currently available 5 modem technology operating at 56 kilobits/second. Clearly the recipient may wish to determine when, and if, a large attached file is downloaded. Further, the recipient will wish to minimise the time taken to download an attachment and the recipient will wish to 10 minimise the storage resource required on the user agent computer for such downloaded attachments. Known systems do not provide such user control and lack of control usually represents a cost and time penalty to the recipient which cannot be avoided without potential loss 15 of information. Cost may be incurred to the local telephone supplier, to the local service provider and cost may also be incurred through temporary loss of computing facilities. The encoding methods and database systems that are features of this invention provide 20 improved control and reduced data download times.

In known systems an email message is sent from an originating user agent to the originator's mail transfer agent and then via the Internet to the recipient's mail transfer agent. The transfers are usually made using a 25 communications protocol known as Simple Mail Transfer Protocol, SMTP.

In one type of currently known system, the recipient user agent periodically communicates with his mail transfer agent to ask if any mail is waiting and then receive mail that is waiting. A communications 30 protocol often used in this type of system is known as Post Office Protocol version 3, POP3. In some situations the recipient may only become aware of the size of a message when it is actually downloading. A further disadvantage of the current system is that such 35 large files may use disc storage capacity in the recipient user agent computer against the wishes of the

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user. For example a computer may have 100 Megabytes of available disk space which is sufficient for hundreds or even thousands of normal text email messages. However ten or less video mails each of ten seconds duration
5 could use all of the available disk storage. Systems using the POP protocol normally delete the message from the mail transfer agent when the receiving user agent has transferred it to his workstation computer.

In another type of system, the mail transfer agent
10 may store messages in a mail box function provided by the mail transfer agent computer. A protocol commonly used for communicating between the mail transfer agent and the user agent is known as Internet Message Access Protocol, IMAP. This protocol is well known by those
15 skilled in the art of electronic mail systems. IMAP allows a user to retrieve, store, delete messages which are actually stored at the mail transfer agent as though the messages have all actually been transferred to a store on the user agent computer. It also allows the
20 text part of messages to be downloaded whilst not retrieving long attachments such as video mails.
However, the system only includes a store for mail messages, which may include attachments and retrieval is accomplished by using the IMAP protocol.

25 Computer email applications at the recipient user agent which support the IMAP protocol usually include functions to inspect the MIME parts of the message and to avoid displaying large amounts of attached data. This data, when displayed directly in email applications,
30 appears to consist of long character strings which are incomprehensible to a user but which are understood by an application, for example, a video player or spreadsheet application program. Such email applications can recognise an attachment and avoid displaying meaningless data. Some applications and
35 operating systems can provide a program link to identify and initiate a program which can properly utilise the

attachment.

In some known systems, an originator of a video mail or video attachment for an email may store the video sequence on a database, which is local to the 5 originator user agent, and attach a reference such as a Uniform Resource Locator, URL, into an email. The recipient can then decide whether, and when, to transfer the actual video to his workstation computer. Such a transfer is usually via the Internet. However, the time 10 to transfer a message over the Internet is limited by the Internet bandwidth available and requires storage in the recipient's workstation. Internet connections provide a data transmission rate which is very variable because of the many types and priorities of data 15 transmissions occurring simultaneously across the world. Often there are periods lasting several seconds when no transfer at all occurs between some nodes. Although systems in which the originator stores a video attachment provide the recipient with a degree of 20 control, recipients who wish to have fast and easy access to many video sequences must maintain their own data base of video attachments. This database local to the recipient user agent still requires a large disk capacity for each video mail attachment.

25 In US Patents 5,781,901 and 5,771,255 assigned to Intel Corporation, there are disclosed systems in which an e-mail attachments is stored relatively local to the dender, the attachment having a unique network address. The recipient is sent an e-mail mesage which includes a 30 link to the attachment. Tnis requires the sender to have an appropriate system to deal with the attachment. As a recipient may receive mail from a large number of sources, there can be no guarantee that all senders will use such a system. As a result, recipients will still face the problem of handling large attachments.

35 In US Patent 5,790,790 assigned to Tumbleweed Software Corporation, there is disclosed another system

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for handling attachments at the sender's end. Again it does not address the problem of a recipient mail system which may receive message from a variety of sources, some of which may contain large attachments.

5 PCT published application WO 98/03928 of Lextron Systems Inc. discloses a web mail system in which a web mail server receives incoming e-mails, converts them to HTML format and stores the messages in a directory structure. If the incoming mail has an attachment, then 10 it can be stored in the same directory and a hyperlink can be provided on the message page so that a user can download or view the attachment.

Whilst web mail systems can be convenient in some circumstances, the use of a web server and a directory 15 structure to store messages is less efficient and slower than storing messages in an e-mail format.

It is an object of the present invention to provide an improved system for handling large file attachments in email messages.

20 Viewed from one aspect the present invention provides an electronic mail system comprising a mail transfer agent which receives incoming mail and allocates the mail to a plurality of private message stores where the mail is stored in e-mail format for access by individual recipients, the system further 25 comprising a database establishing a plurality of private attachment stores for access by individual recipients, and attachment processing means which scans incoming mail, detects attachments, and carries out the 30 following processing steps when an attachment is detected in an incoming item of mail:

(a) removing the attachment from the incoming item of mail and placing the attachment in the private attachment store for the recipient of the incoming mail item;

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- (b) inserting in the incoming item of mail a link to the attachment in the private attachment store; and
- 5 (c) allocating the incoming item of mail, including the link, to the private message store for the recipient;

whereby the recipient may access the incoming item of mail in the private message store using an e-mail 10 protocol, and if desired gain access to the attachment in the private attachment store by activating the link in the incoming item of mail.

Using such a system the recipients of the email messages may manage large file attachments stored in a database located at a local message transfer agent. 15 Consequently the requirement for large mass storage in the user agent workstation is avoided. In preferred embodiments of the invention, transfer from the recipient message transfer agent to the receiving user 20 agent occurs at a reliable and high data transfer rate and at a time convenient to the recipient user agent. For example, the user agent may chose to transfer video sequences in off-peak times when telephone connection 25 between message transfer agent and user agent is provided at a reduced charge rate. Only those attachments that are required at any particular time are transferred to the user agent workstation and stored on a temporary basis. This method of working ensures a smooth workflow and optimum communications cost.

30 Many configurations of computer systems and communications systems are known and it will be appreciated that the invention may be applied in systems using other configurations of mail server and mail transfer agents. For example a corporate organisation 35 may include a computer server directly connected to the internet which acts as the message transfer agent for its own employees. In this case, connection to

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individual user's workstations may be by a local area network, and the corporate computer server will provide the functions of the mail transfer agent which are described in this specification.

5 Viewed from another aspect of the invention there is provided a method for processing attachments on items of electronic mail received by a mail transfer agent which receives incoming mail and allocates the mail to a plurality of private message stores where the mail is stored in e-mail format for access by individual recipients, the method comprising the steps of providing a database establishing a plurality of private attachment stores for access by individual recipients, processing incoming mail, detecting attachments, and carrying out the following attachment processing steps when an attachment is detected in an incoming item of mail:

- 20 (a) removing the attachment from the incoming item of mail and placing the attachment in the private attachment store for the recipient of the incoming mail item;
- 25 (b) inserting in the incoming item of mail a link to the attachment in the private attachment store; and
- (c) allocating the incoming item of mail, including the link, to the private message store for the recipient;

30 whereby the recipient may access the incoming item of mail in the private message store using an e-mail protocol, and if desired gain access to the attachment in the private attachment store by activating the link in the incoming item of mail.

35 Viewed from another aspect of the present invention, there is provided a computer software product

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for installation on data processing means serving as a mail transfer agent for an electronic mail system which receives incoming mail and allocates the mail to a plurality of private message stores where the mail is stored in e-mail format for access by individual recipients, the computer software product comprising code such that when installed on the data processing means there will be created attachment processing means which scans incoming mail, detects attachments, and carries out the following processing steps when an attachment is detected in an incoming item of mail:

- (a) removing the attachment from the incoming item of mail and placing the attachment in a private attachment store for the recipient of the incoming mail item, the private attachment store being established by a database;
- (b) inserting in the incoming item of mail a link to the attachment in the private attachment store; and
- (c) allocating the incoming item of mail, including the link, to the private message store for the recipient;

whereby the recipient may access the incoming item of mail in the private message store using an e-mail protocol, and if desired gain access to the attachment in the private attachment store by activating the link in the incoming item of mail.

Viewed from another aspect of the present invention, there is provided a computer software product for installation on data processing means, the product comprising code which when installed on the data processing means will provide a mail transfer agent for an electronic mail system which receives incoming mail and allocates the mail to a plurality of private message

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stores where the mail is stored in e-mail format for access by individual recipients, the mail transfer agent also being associated with a database establishing a plurality of private attachment stores for access by individual recipients, the computer software being such that when installed on the data processing means there will be created attachment processing means which scans incoming mail, detects attachments, and carries out the following processing steps when an attachment is detected in an incoming item of mail:

- (a) removing the attachment from the incoming item of mail and placing the attachment in the private attachment store for the recipient of the incoming mail item;
- (b) inserting in the incoming item of mail a link to the attachment in the private attachment store; and
- (c) allocating the incoming item of mail, including the link, to the private message store for the recipient;

whereby the recipient may access the incoming item of mail in the private message store using an e-mail protocol, and if desired gain access to the attachment in the private attachment store by activating the link in the incoming item of mail.

In some embodiments of the present invention, the attachment processing means may carry out the processing steps in respect of all attachments on incoming items of mail. Alternatively, the attachment processing means carries out the processing steps only in respect of attachments meeting predetermined criteria. Such predetermined criteria could concern the size of an attachment, and / or the type of an attachment, such as whether the attachment is a video file.

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In a preferred embodiment, prior to placing an attachment in the private attachment store, the attachment processing means decodes the attachment. The attachment is preferably converted from 7 bit data to 8 bit data before placing the attachment in the private attachment store.

In a preferred embodiment, each private attachment store has a first part which stores attachment files and a second part which stores message headers which identify the location in the first part of the attachment files relating to particular messages. The message headers preferably comprise HTML data pages. In such a system, the link which is placed in an incoming item of mail by the attachment processing means may be a hyperlink which provides access to the HTML data page which is associated with the attachment file in the private attachment store.

Thus, in accordance with preferred embodiments of the present invention, the message transfer agent which provides network connection services for email recipients, provides a system for examining email attachments, replacing the attachment with a reference, forwarding the reduced email to the recipient, and storing the attachment in a section of an application-oriented database which is private to the recipient. The reference to the attachment which is embedded in the mail message is in the form of a universal resource locator, URL, which allows the attachment to be retrieved through a web browser rather than an email application.

As regards the software, this may be such that when installed on the data processing means the software creates the database establishing the plurality of private attachment stores. Alternatively, the software may be installed in conjunction with database software which when installed on data processing means will create the database establishing the plurality of

private attachment stores which is to be associated with the mail transfer agent.

The software may be provided for installation in any suitable format. For example, it could be recorded 5 on a physical data carrier such as a disk, CD-ROM or tape for subsequent installation on data processing means. It could be provided as a signal transmitted over a network. It could be recorded on a server for distribution over a network for subsequent installation 10 on data processing means, for example by being downloaded over the Internet. The software may be provided in encrypted and / or compressed form.

The software may be completely self contained, or 15 may modify existing mail transfer agent software, or may work as an add-in alongside existing software.

Some embodiments of the present invention will now be described by way of example and with reference to the accompanying drawings, in which:

Figure 1 shows the steps in sending a message from 20 originator to recipient according to the current known art;

Figure 2 shows the steps involved in sending a message and attachments according to an embodiment of the present invention;

Figure 3 shows a message containing two video 25 attachments before and after processing in accordance with the present invention;

Figure 4 shows the video message storage system used for the processed message attachments in accordance 30 with the present invention;

Figure 5A shows an example of an email header and text message;

Figure 5B shows an example of two video attachments according to the current art;

Figure 5C shows the attachments after processing in accordance with the present invention; and

Figure 6 shows how various systems may be inter-

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connected using the Internet and other communications channels.

Referring now in detail to the drawings, Figure 1 shows a system according to the current state of the art in which a message, 17, which is encoded using IETF email specifications referred to previously, is transferred from an originating user agent 12 to a recipient user agent 16. The message is first sent to an originator message transfer agent, 13, and then relayed, via the Internet, 11, to a receiving message transfer agent, 14. The protocol used for these message transfers is usually SMTP. The receiving message transfer agent, 14, provides a message store, or mail box, 15. The recipient user agent, 16, may then retrieve messages from the message store, 15, using for example, IMAP or POP3 protocols. The system according to the current invention may operate in this mode by using a subset of its capabilities.

Figure 2 shows a system in accordance with an embodiment of the present invention, which is similar to the system shown in figure 1, but having an additional video message store, 26, and software plug-in function 25, at the recipient message transfer agent, 24. The plug-in function, 25, examines incoming email in order to detect Video, or other, attachments. The plug-in may then send the video attachment to the video message store and insert a reference into the mail message. As described earlier, the video or other attachments included in the received email are encoded using the 7bit US-ASCII encoding which represents 8 bit byte video data. The plug-in function 25 decodes the 7 bit data into 8 bit data before storing the data in the database. Converting from 7 bit data to 8 bit data at the message transfer agent is an advantage of the current invention because the size of the database file is reduced. Other advantages of converting from 7 bit to 8 bit data at the message transfer agent will become apparent later in

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relation to retrieval of data by the user agent. In some arrangements it may be necessary to convert a 6 bit encoded attachment, such as one which has been encoded using Base-64. In general, the system will convert data words consisting of 7 or less bits of wanted data to 8 bit byte oriented data.

Referring again to Figure 2, the recipient user agent, 28, may access text messages from the message store 27 using POP3 or IMAP protocols as in the known prior art. The recipient user agent may also access video message content from the video message store, 26, using the well known HTTP hypertext transport protocol as used by systems using the internet, for example, the world wide web (www). The HTTP access method of retrieving video data that has already been converted to 8 bit data provides faster user access than the known methods using IMAP protocols. Faster access occurs because the volume of data for each video sequence is lower in 8 bit data than 7 bit data (resulting in faster access and transmission time), and because no decoding is required by the user agent computer.

Figure 3 shows, by way of example, an email message 31 which consists of a header part, 311, a message part, 312, and video attachments, 36 and 37. Figure 3 also shows how the email message is processed by plug-in 25 into email message 32. The email message, including its attachments exists, and has been received, as a single stream of bytes of data comprising the data of sections 311, 312, 36 and 37.

Referring to figure 3, the two video attachments, 36 and 37, are removed from the message, 31, by the plug-in function, 25 of figure 2, and placed in data pages 34 and 35. Two new attachments, comprising HTML (HyperText Mark-up Language defined by the World Wide Web Consortium) page references, 33 and 38 replace the video attachments, 36 and 37 respectively, to form the new message 32. New message 32 is placed in message

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store 27 of figure 2.

Data pages, 34 and 35, are constructed using HTML. The two HTML data pages, 34 and 35, are then stored in the video message store, 26 in figure 2. HTML is a well-known and commonly used data coding system for combining formatting commands with text-data, graphical data and cross-reference links. The cross-reference links may be both within data entities and to other data entities.

The video message store will now be described in more detail with reference to figure 4 and then the detail of the message structure will be described with reference to figures 5A to 5C. Referring to figure 4, the video store, 40, shows the video message store 26 in detail. The video store may be considered as having two principle modes of operation concerned respectively with writing video data and reading video data. A third file maintenance mode will also be described later.

In the writing mode, the video message store is loaded automatically with video data by the plug-in software, 25, and the www (world wide web) server and database control, 48, as previously described with reference to figure 3.

In the preferred embodiment, the video database is located at a service provider or corporate server and thus the video database may contain video sequences for many different users. Each user is therefore allocated a specific part of the database that may only be accessed by the authorized user. Figure 4 shows three video storage areas, 43, for three users, by way of example. It will be appreciated that there may be a large number of users each with a similar storage area. It will also be appreciated that the storage areas shown do not represent physical storage areas but are allocated from available storage according to known database principles.

In the preferred embodiment, each of the video

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storage areas, 43, is divided into two parts. The first part, is a message header store, shown for the first user as message header store, 45. Data pages, 421 and 422, from the HTML data pages, 34 and 35, are loaded 5 into the store to identify each video sequence and its location allocated by the database controller and www server, 48. The second part of the video storage area, 44, is loaded with the video sequences so that the message headers contained in store section 45 identify 10 the location of video sequences in the store section 44.

The video store, 40, is a structured database of video sequences. The general structure and operation of databases is known in computer engineering but the access methods and structure in the preferred embodiment 15 of the invention are chosen to be compatible with the email and Internet system described previously. However, it will be appreciated that any database structure and access method could be used.

The database read operation will now be described. 20 As previously described, the recipient user agent, 41, may retrieve email from message store, 27 of figure 2. The user may use one of a variety of commercially available email software packages such as HotMail (Trade Mark), available from Microsoft Inc. in order to 25 retrieve email. To take full advantage of this invention, the recipient user agent also requires an Internet browser program, such as Internet Explorer (Trade Mark), also available from Microsoft Inc.

As previously discussed, some of the email messages 30 may have had video or other attachments removed by the plug-in 25 and stored in the video store 40. The HTML data pages that replace the video attachments may be displayed to the user as icons or other hyperlinks within the user email software. In order to view a 35 particular video sequence, the user selects the appropriate icon or link, usually by clicking a computer mouse with a screen cursor over a display of the icon or

5 hyperlink. Such selection techniques are well known in the field of windows based computing. The selection action initiates the Internet browser program with an instruction to fetch the data specified by the icon or hyperlink selected.

10 The icon or hyperlink identifies a file held in the video data store 40, the browser program requests the selected video sequence from the www server 48, using the user agent to message transfer agent connection path 49. Because the video data in the database is private to individual users, it is necessary for users to log-on to the database for a session during which one or more video sequences are retrieved. Such log-on procedures are well known and do not form part of this invention.

15 Following the log-on procedure, the www server and database control, 48, interrogates the message headers 45, via data path 47, to identify the location of the selected video sequence. The selected video data file is then streamed out of database memory via a high speed video streaming data path, 46, and the www server, 48, to the user agent 41.

20 It will be appreciated that the video database which stores 8 bit decoded video and has a high speed video streaming path used in conjunction with the direct connection from the message transfer agent to the user agent is a feature of preferred embodiments of this invention which allows fast or real time video retrieval not previously possible. It will also be appreciated that the video may be streamed at a data rate that is sufficiently high for viewing in real time on a device which does not have mass storage, for example a television receiver.

25 It will also be appreciated that the foregoing description, which refers to figures 3 and 4, is of only one embodiment of the invention. Message types other than video may be included in the message and there may be any number of attachments. IETF document RTF 2046,

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together with associated documents, describes the types and detail of possible attachments. The specification RTF 2046 allows the inclusion of multiple types of attachment.

5 Referring again to figure 2, the plug-in function,
25 in figure 2, of the message transfer agent processes mail messages that may include video attachments. The precise structure of an incoming mail message is not a feature of the present invention but a typical message
10 structure will now be described in order that the function of the preferred embodiment of the present invention may be clearly understood.

Figures 5A and 5B give an example of a typical electronic mail message, conforming to the previously mentioned IETF specifications, which may be processed by the software plug-in. The data shown in figure 5A and 5B are one continuous data stream but are shown, for convenience, split into two parts. Also in Figure 5B, two sections of data have been omitted from the figure for convenience. These sections are marked on the
20 Figure as [REMOVED DATA].

Figure 5C shows message data from figure 5B after processing by software according to the current invention. Data from figure 5A remains unchanged by the current invention and hence data from figure 5A and 5C form a complete processed message. Figures 5A to 5C conform to the IETF RFC documents defining email structure. However, the information is displayed to users in a variety of formats by various available email
25 software applications. Many software applications will limit the information displayed to the user to text messages and useful information, such as the sender's address and subject only.

Referring to Figure 5A, the first data, 51, is information which is added to the message as it progresses through the system, as previously described with reference to Figure 1. The information, 51,

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indicates the route which the message has taken, the originator and recipient email address, message identification number and time information relating to progress through the Internet system.

5 The following data, 52, indicates that one or more attachments is present and defines the type of attachment. In this example the content type is shown as "multipart/mixed" which indicates that there are several sections to the message and that the sections
10 are of different types. The IETF documents define all allowable content types. The sections of the message are separated by a data string called a boundary and shown at 52. This boundary data string is repeated at each boundary between sections in the message. Each
15 occurrence of the boundary data string is detected by user agent and message transfer agent software to allow correct partitioning of the message.

20 The data, 53, starts with the boundary data string and a definition of the content type of the data following until the next boundary data string. In this example, the content is defined as text/plain and defines the text part of the message, 54. Email messages that do not have attachments may omit the boundary data string.

25 The text section of the message, 54, is terminated by the boundary string 55. The data after boundary data string 55 continues in figure 5B. For purposes of clarity in the diagrams, the boundary string 55 is repeated at the start of figure 5B. The boundary string actually occurs only once between sections.

30 Figure 5B shows two video attachments starting at 56 and 58. Both attachments are of content type video/Quicktime. Quicktime (Trade Mark) is a video movie format devised by Apple Computer Inc. and widely available. It will be appreciated that the content type video/Quicktime is shown as an example and that any content type and sub type allowed by the IETF documents

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could occur. It will also be appreciated that the number of attachments is not limited to the two attachments shown and that any number of attachments allowed by the IETF documentation are possible for use with this
5 invention.

The data field 56 describes the data, 57, which is the video data sequence, named Canyon-1 in this example. In this example the content transfer encoding is shown as Base-64. Base-64 encoding is a method which has been
10 described earlier. The data field 58 describes the last attachment, named Canyon-2 which comprises video data 59. Finally, the boundary data string 50 indicates the end of the message.

The plug-in software, 25 of figure 2, extracts and
15 analyses the content type descriptors and boundary data strings, 52, 53, 55, 56, 58 and 50. The boundary string 52 allows correct partitioning, and hence analysis, of the whole email message. The plug-in software detects the boundary 53 as being identical to boundary
20 definition 52 and then examines the content type which immediately follows. Since in this example the content type is text/plain, the part of the message to the next boundary data string 55 is not modified.

However, when the data 56 after the boundary data
25 string 55 is examined and the content type video/Quicktime is detected, the plug-in software replaces the data 56 with an HTML description of the video data as shown in figure 5C 501. The data 57, which is terminated by boundary data string 58, is
30 converted to 8 bit data, placed in a file named canyon-1.html and loaded to the video portion, 44, of video data store 40. The location of the file canyon-1.html is given as a universal resource locator, URL, shown as part of data 502. Data 502 is used to build the message
35 headers 45 which are stored in the video data store. Data 502 may also contain informative text which will be displayed when the message header is accessed to

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retrieve video data as described earlier.

By the process described, the plug-in software has replaced the video data 57 with the HTML page 502 which ends with the boundary data string 503. Boundary data string 503 is identical to the boundary data string defined for this email message at 52. -

The second attachment starts at boundary data string 58 and, in this example, is also of content type video/Quicktime. In a manner similar to that described above, the plug-in software replaces the descriptive information following boundary data string 58 with HTML description 504 which is terminated by boundary data string 505. The video data 59 is converted to 8 bit data, placed in file canyon-2.html and written as a second entry into message header store 45 and video store 44.

It will be noted that the incoming message consisted of data illustrated in Figure 5A concatenated with the data illustrated in Figure 5B and that the plug-in software generates a new message which consists of data illustrated in figure 5A concatenated with data illustrated in figure 5C. The new message generated by this means is stored in message store 27 and is the only email message available to the user agent. The user agent accesses the video content from the video store using a web browser and HTTP protocols as described earlier.

Using known standard file management tools, the user may manage the video file data base from user agent terminal 41. Functions normally available include "copy", "delete" and download.

In summary, the preferred embodiments of the invention involve the use of plug-in software and a video data base, both of which reside at the message transfer agent, which may be e.g. a remote site of an Internet Service Provider or e.g. an Intranet corporate server.

Figure 6 shows examples of three different methods by which computer systems may be connected to the Internet, 64. Connections to the Internet are made to allow several types of data transfer and other functions such as searching for particular information. Electronic mail, which is the subject of this invention, is just one use of the Internet system.

In the first method according to the previous description, computer, 661, is an example of a user agent computer, 661, connected to the internet via a service provider, 671, which functions as a message transfer agent. Computer user agent 661 connects to service provider 671 via a telephone connection 651, which may be a dial-up connection or a dedicated digital line service. Service providers 671 and 672 will usually each support more than one user agent computer similar to computer 661. User agent 662 is shown connected to service provider 672 via telephone connection 652. In the known Internet system there are currently several million computers connected directly or via service providers, each of which may be a user agent. Only a small number of computer terminals are shown in figure 6 for clarity. It will be appreciated that user agents, 661 and 662 may each be originating or receiving user agents and it will also be appreciated that at different times any computer may be an originating or recipient user agent.

The second and third examples of methods of connection to the Internet shown in figure 6 are commonly used by corporate organisations.

In the second example, small organisations are connected to the Internet, 64, through a service provider, 672, and an internal corporate communications server computer, 691. In this example, the corporate server, 691, receives or sends mail messages and processes incoming messages using a plug-in which is functionally equivalent to the message transfer agent

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5 plug-in described previously. The video attachments are stored in corporate file server, 692. The user agents, 68, who may originate or send messages, are connected to the corporate communications and file servers via a local Area network, 693. User agents may also have access to the corporate network, 693, from a computer, 694, situated at a remote location by using a telephone or data connection.

10 The third method of connection shown as an example is generally used by large organisations who connect directly to Internet, 64, via their own firewall, 63, and communications server, 621. The firewall is a well-known system to protect the corporate system from illegitimate access from any person connected to the Internet and to examine all incoming data to prevent computer viruses from infecting the corporate computer. 15 In the systems described previously, this firewall protection may be provided by the service provider or an organisation's own computer system. The operation of the system is equivalent to the second example.
20 Communications server, 621, uses a plug-in to process incoming messages and store the video attachments in file server, 622. User agent terminals, 61, are connected to the corporate communications servers via the local area network 623. The present invention is particularly useful in corporate organisations because it is common for the corporate servers to display a message on a user workstation immediately an email message is received. The user agent may wish to examine 25 the message immediately but usually does not wish to have a large attachment loaded into his computer in the middle of his normal work.
30 It will be appreciated that these three methods of connection to the Internet have been given as examples of all possible methods. For example the service providers 671 and 672 may connect to some user agent computers via wireless communication systems commonly

- 25 -

used in mobile telephone systems.

The user agent computer may vary in performance and specification. For example, the user agent computer may be a simple device, without disc storage, comprising an
5 interface unit connected to a television receiver.

Other examples of user agent computers are personal work stations such as those based on architectures originally devised by International Business Machines or Apple Computer Inc. and known as personal computers or PC's.
10

In preferred embodiments in accordance with the present invention, there is improved performance by storing data attached to incoming emails in a database which may be accessed both at a time which is convenient for the user agent and by a method which provides
15 optimum high speed performance. The function of the plug-in software of the preferred embodiment is to examine incoming email messages, replace video attachments by corresponding HTML attachments and also to decode and load the video data into the video data store.
20

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CLAIMS

1. An electronic mail system comprising a mail transfer agent which receives incoming mail and allocates the mail to a plurality of private message stores where the mail is stored in e-mail format for access by individual recipients, the system further comprising a database establishing a plurality of private attachment stores for access by individual recipients, and attachment processing means which scans incoming mail, detects attachments, and carries out the following processing steps when an attachment is detected in an incoming item of mail:

- (a) removing the attachment from the incoming item of mail and placing the attachment in the private attachment store for the recipient of the incoming mail item;
- (b) inserting in the incoming item of mail a link to the attachment in the private attachment store; and
- (c) allocating the incoming item of mail, including the link, to the private message store for the recipient;

whereby the recipient may access the incoming item of mail in the private message store using an e-mail protocol, and if desired gain access to the attachment in the private attachment store by activating the link in the incoming item of mail.

2. A system as claimed in claim 1, wherein the attachment processing means carries out the processing steps in respect of all attachments on incoming items of mail.

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3. A system as claimed in claim 1, wherein the attachment processing means carries out the processing steps only in respect of attachments meeting predetermined criteria.

4. A system as claimed in claim 3, wherein the predetermined criteria concern the size of an attachment.

5. A system as claimed in claim 3, wherein the predetermined criteria concern the type of an attachment.

6. A system as claimed in claim 5, wherein the predetermined criteria include the attachment being a video file.

7. A system as claimed in any preceding claim, wherein prior to placing an attachment in the private attachment store, the attachment processing means decodes the attachment.

8. A system as claimed in claim 7, wherein the attachment processing means converts the attachment from data words consisting of 7 or less bits of wanted data to 8 bit byte oriented data before placing the attachment in the private attachment store.

9. A system as claimed in any preceding claim, wherein each private attachment store has a first part which stores attachment files and a second part which stores message headers which identify the location in the first part of the attachment files relating to particular messages.

10. A system as claimed in claim 9, wherein the message headers comprises HTML data pages.

11. A system as claimed in claim 10, wherein the link which is placed in an incoming item of mail by the attachment processing means is a hyperlink which provides access to the HTML data page which is associated with the attachment file in the private attachment store.

12. A system as claimed in claim 1, wherein the attachment processing means operates on a video file attachment to decode the attachment and convert it from data words consisting of 7 or less bits of wanted data to 8 bit byte oriented data, places the 8 bit video data file in a first part of the private attachment store, and places an HTML data page linked to the video data file in a second part of the private attachment store, and wherein the link placed in the incoming item of mail is a hyperlink to the HTML data page, whereby a user may access the incoming item of mail by means of a user agent on a user workstation and activate the hyperlink so that the 8 bit video data file is streamed from the private attachment store to the user workstation.

13. A system as claimed in claim 12, wherein the video data file which is streamed to the user workstation is viewed on the workstation by means of a browser.

14. A method for processing attachments on items of electronic mail received by a mail transfer agent which receives incoming mail and allocates the mail to a plurality of private message stores where the mail is stored in e-mail format for access by individual recipients, the method comprising the steps of providing a database establishing a plurality of private attachment stores for access by individual recipients, processing incoming mail, detecting attachments, and carrying out the following attachment processing steps when an attachment is detected in an incoming item of

mail:

- (a) removing the attachment from the incoming item of mail and placing the attachment in the private attachment store for the recipient of the incoming mail item;
- (b) inserting in the incoming item of mail a link to the attachment in the private attachment store; and
- (c) allocating the incoming item of mail, including the link, to the private message store for the recipient;

whereby the recipient may access the incoming item of mail in the private message store using an e-mail protocol, and if desired gain access to the attachment in the private attachment store by activating the link in the incoming item of mail.

15. A method as claimed in claim 14, wherein the attachment processing steps are carried out in respect of all attachments on incoming items of mail.

16. A method as claimed in claim 14, wherein the attachment processing steps are carried out only in respect of attachments meeting predetermined criteria.

17. A method as claimed in claim 16, wherein the predetermined criteria concern the size of an attachment.

18. A method as claimed in claim 16, wherein the predetermined criteria concern the type of an attachment.

19. A method as claimed in claim 18, wherein the

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predetermined criteria include the attachment being a video file.

20. A method as claimed in any any of claims 14 to 19, wherein prior to placing an attachment in the private attachment store, the attachment is decoded.

21. A method as claimed in claim 20, wherein the attachment is converted from data words consisting of 7 or less bits of wanted data to 8 bit byte oriented data before being placed in the private attachment store.

22. A method as claimed in any of claims 14 to 21, wherein each private attachment store has a first part which stores attachment files and a second part which stores message headers which identify the location in the first part of the attachment files relating to particular messages.

23. A method as claimed in claim 22, wherein the message headers comprises HTML data pages.

24. A method as claimed in claim 23, wherein the link which is placed in an incoming item of mail is a hyperlink which provides access to the HTML data page which is associated with the attachment file in the private attachment store.

25. A method as claimed in claim 14, wherein a video file attachment is decoded and converted from data words consisting of 7 or less bits of wanted data to 8 bit byte oriented data, the 8 bit video data file is placed in a first part of the private attachment store, and an HTML data page linked to the video data file is placed in a second part of the private attachment store, and wherein the link placed in the incoming item of mail is a hyperlink to the HTML data page, whereby a user may

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access the incoming item of mail by means of a user agent on a user workstation and activate the hyperlink so that the 8 bit video data file is streamed from the private attachment store to the user workstation.

26. A method as claimed in claim 25, wherein the video data file which is streamed to the user workstation is viewed on the workstation by means of a browser.

27. A computer software product for installation on data processing means serving as a mail transfer agent for an electronic mail system which receives incoming mail and allocates the mail to a plurality of private message stores where the mail is stored in e-mail format for access by individual recipients, the computer software product comprising code such that when installed on the data processing means there will be created attachment processing means which scans incoming mail, detects attachments, and carries out the following processing steps when an attachment is detected in an incoming item of mail:

- (a) removing the attachment from the incoming item of mail and placing the attachment in a private attachment store for the recipient of the incoming mail item, the private attachment store being established by a database;
- (b) inserting in the incoming item of mail a link to the attachment in the private attachment store; and
- (c) allocating the incoming item of mail, including the link, to the private message store for the recipient;

whereby the recipient may access the incoming item of mail in the private message store using an e-mail

protocol, and if desired gain access to the attachment in the private attachment store by activating the link in the incoming item of mail.

28. A computer software product for installation on data processing means, the product comprising code which when installed on the data processing means will provide a mail transfer agent for an electronic mail system which receives incoming mail and allocates the mail to a plurality of private message stores where the mail is stored in e-mail format for access by individual recipients, the mail transfer agent also being associated with a database establishing a plurality of private attachment stores for access by individual recipients, the computer software being such that when installed on the data processing means there will be created attachment processing means which scans incoming mail, detects attachments, and carries out the following processing steps when an attachment is detected in an incoming item of mail:

- (a) removing the attachment from the incoming item of mail and placing the attachment in the private attachment store for the recipient of the incoming mail item;
- (b) inserting in the incoming item of mail a link to the attachment in the private attachment store; and
- (c) allocating the incoming item of mail, including the link, to the private message store for the recipient;

whereby the recipient may access the incoming item of mail in the private message store using an e-mail protocol, and if desired gain access to the attachment in the private attachment store by activating the link

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in the incoming item of mail.

29. A computer software product as claimed in claim 27 or 28, wherein when installed on the data processing means the code creates the database establishing the plurality of private attachment stores.-

30. A computer software product as claimed in claim 27 or 28, in combination with a database software product which when installed on data processing means will create the database establishing the plurality of private attachment stores which is to be associated with the mail transfer agent.

31. A computer software product as claimed in any of claims 27 to 30, being such that when installed on the data processing means the attachment processing steps may be carried out in respect of all attachments on incoming items of mail.

32. A computer software product as claimed in any of claims 27 to 30, being such that when installed on the data processing means the attachment processing steps may be carried out only in respect of attachments meeting predetermined criteria.

33. A computer software product as claimed in claim 32, wherein the predetermined criteria concern the size of an attachment.

34. A computer software product as claimed in claim 33, wherein the predetermined criteria concern the type of an attachment.

35. A computer software product as claimed in claim 34, wherein the predetermined criteria include the attachment being a video file.

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36. A computer software product as claimed in any of claims 27 to 35, being such that when installed on the data processing means, an attachment is decoded prior to being placed in the private attachment store.

37. A computer software product as claimed in claim 36, wherein the attachment is converted from data words consisting of 7 or less bits of wanted data to 8 bit byte oriented data before being placed in the private attachment store.

38. A computer software product as claimed in any of claims 27 to 37, being such that when installed on the data processing means, there are established private attachment stores each having a first part which stores attachment files and a second part which stores message headers which identify the location in the first part of the attachment files relating to particular messages.

39. A computer software product as claimed in claim 38, wherein the message headers comprises HTML data pages.

40. A computer software product as claimed in claim 39, wherein the link which is placed in an incoming item of mail is a hyperlink which provides access to the HTML data page which is associated with the attachment file in the private attachment store.

41. A computer software product as claimed in claim 27 or 28, being such that when installed on the data processing means a video file attachment is decoded and converted from data words consisting of 7 or less bits of wanted data to 8 bit byte oriented data, the 8 bit video data file is placed in a first part of the private attachment store, and an HTML data page linked to the video data file is placed in a second part of the private attachment store, and wherein the link placed in

the incoming item of mail is a hyperlink to the HTML data page, whereby a user may access the incoming item of mail by means of a user agent on a user workstation and activate the hyperlink so that the 8 bit video data file is streamed from the private attachment store to the user workstation.

42. A computer software product as claimed in claim 41, wherein the video data file which is streamed to the user workstation is of a type that can be viewed on the workstation by means of a browser.

43. A computer software product as claimed in any of claims 27 to 42, installed on data processing means for operation in an electronic mail system.

44. A computer software product as claimed in any of claims 27 to 42, recorded on a data carrier for subsequent installation on data processing means.

45. A computer software product as claimed in any of claims 27 to 42, recorded on a server for distribution over a network for subsequent installation on data processing means.

46. A computer software product as claimed in any of claims 27 to 42, provided as a signal transmitted over a network for subsequent installation on data processing means.

47. A computer software product as claimed in claim 44, 45 or 46, in encrypted and / or compressed form.

48. A method of providing an electronic mail system as claimed in claim 1, comprising the step of installing on data processing means a computer software product as claimed in any of claims 44 to 47.

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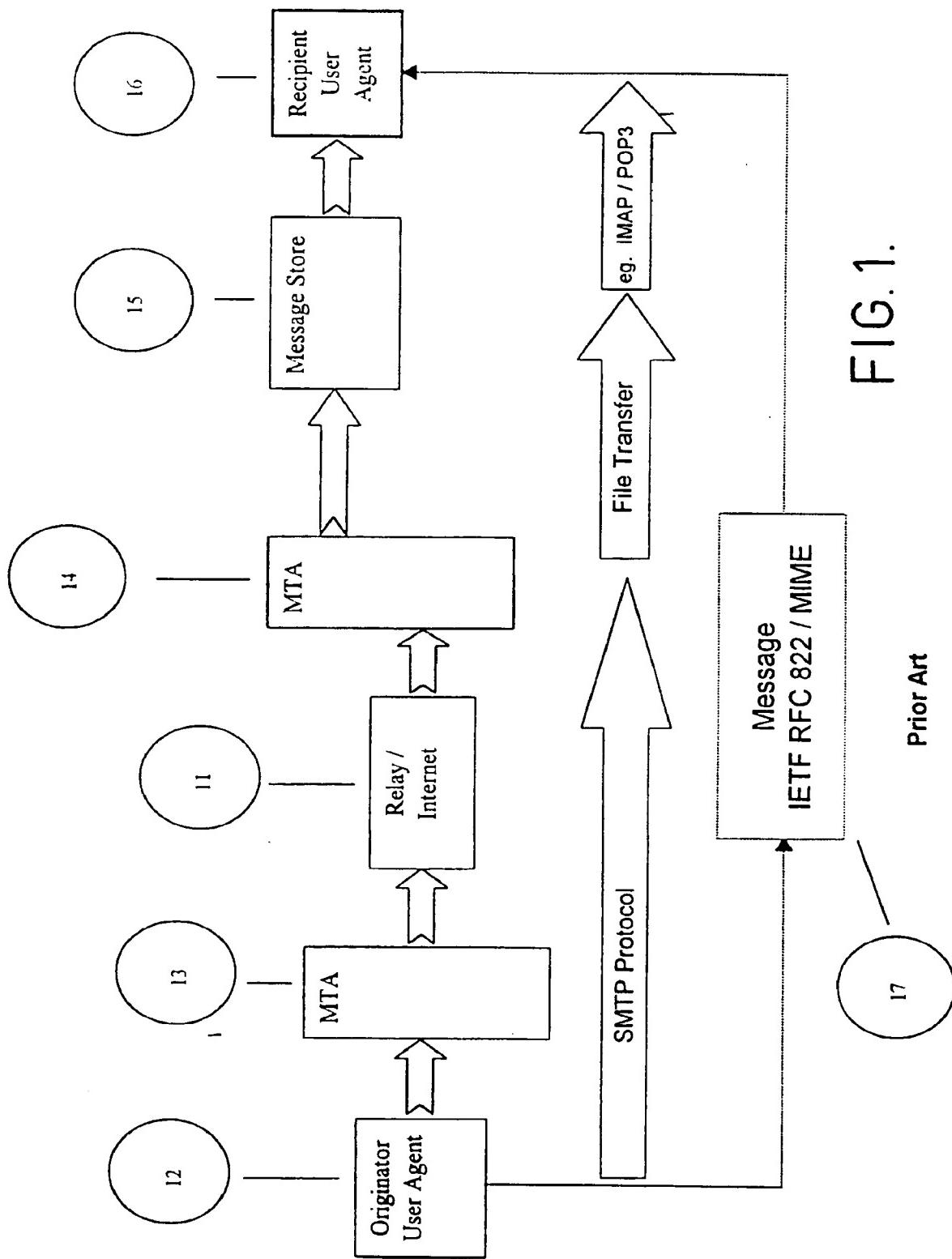


FIG. 1.

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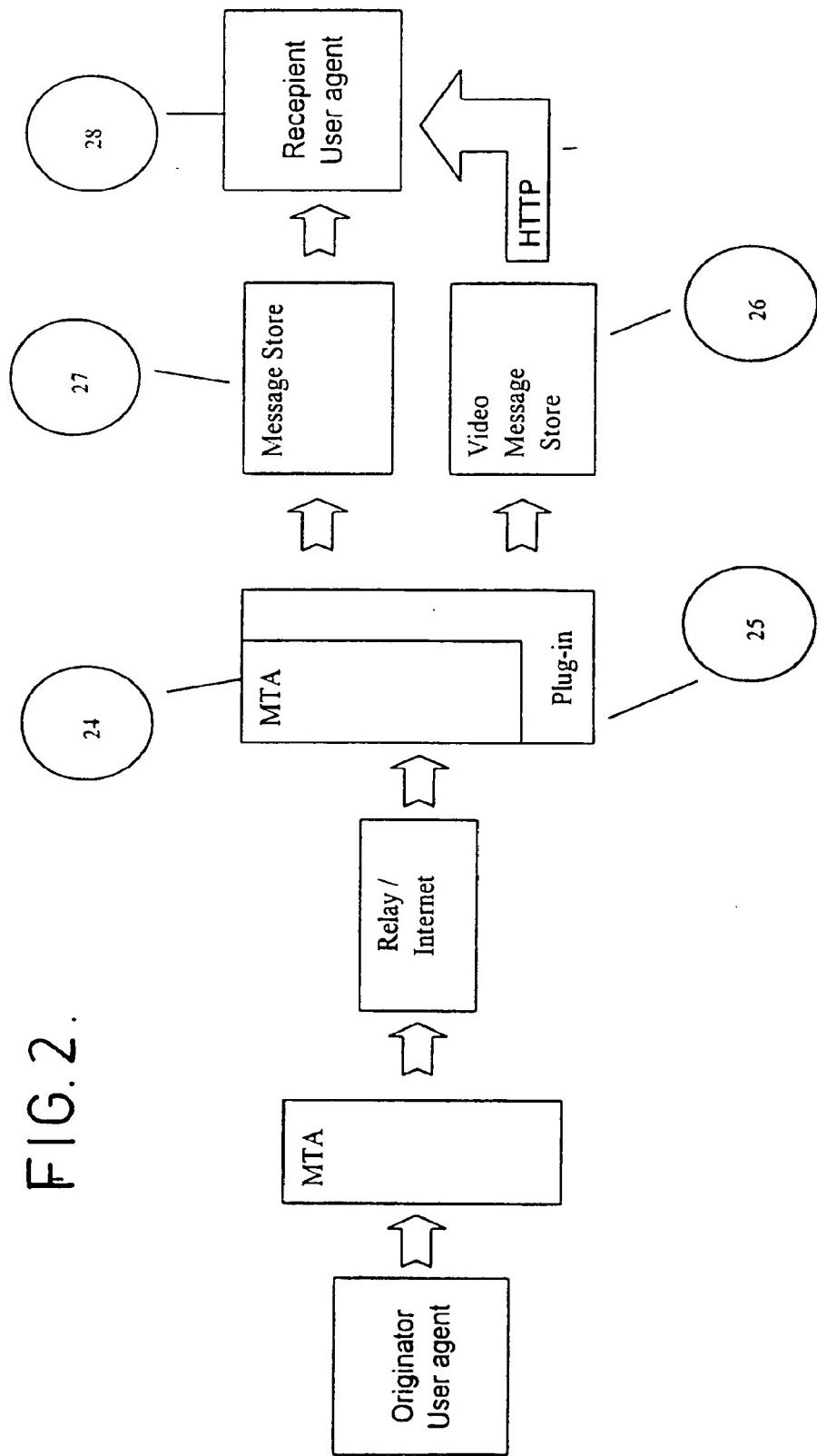
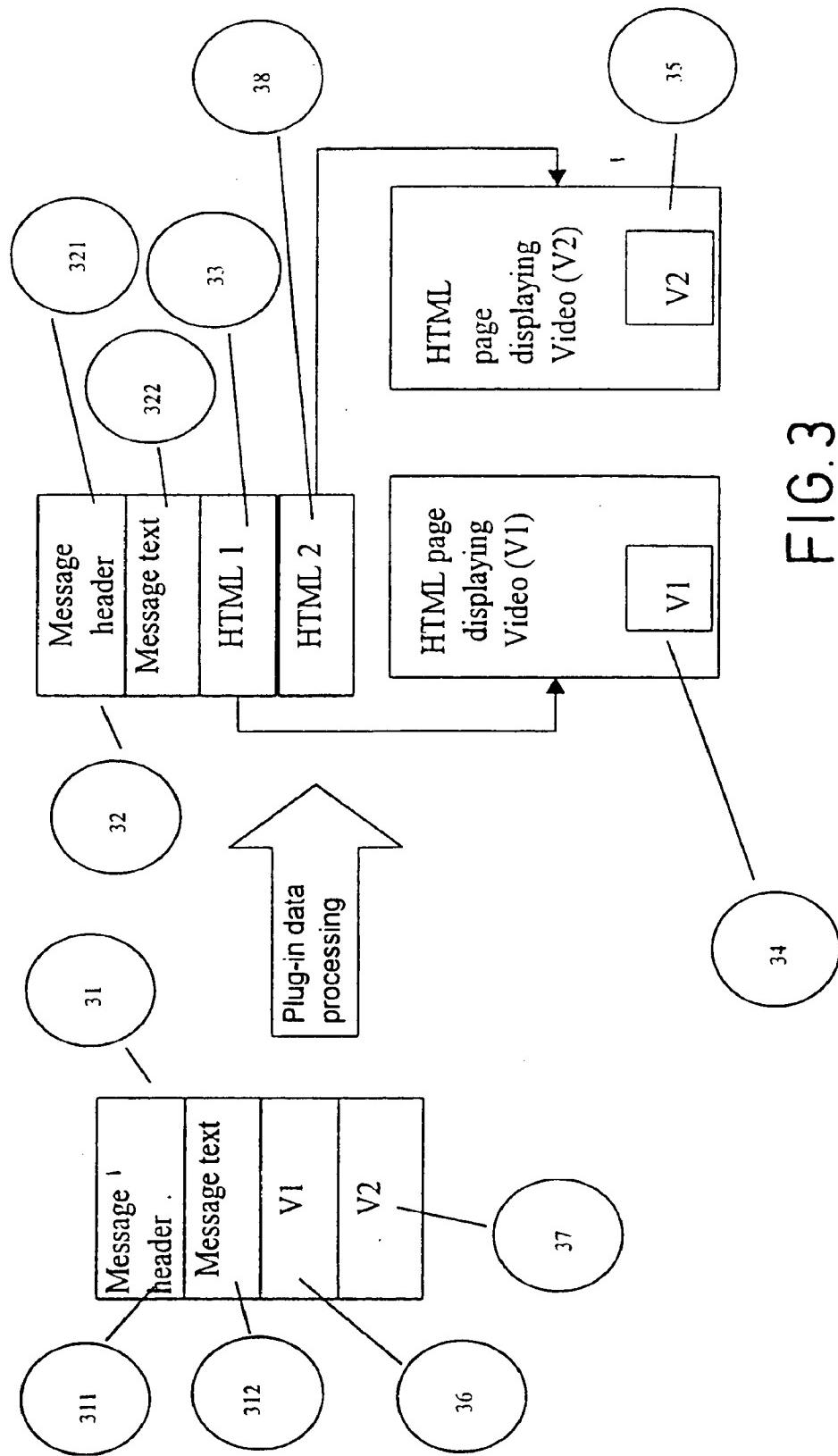


FIG. 2.

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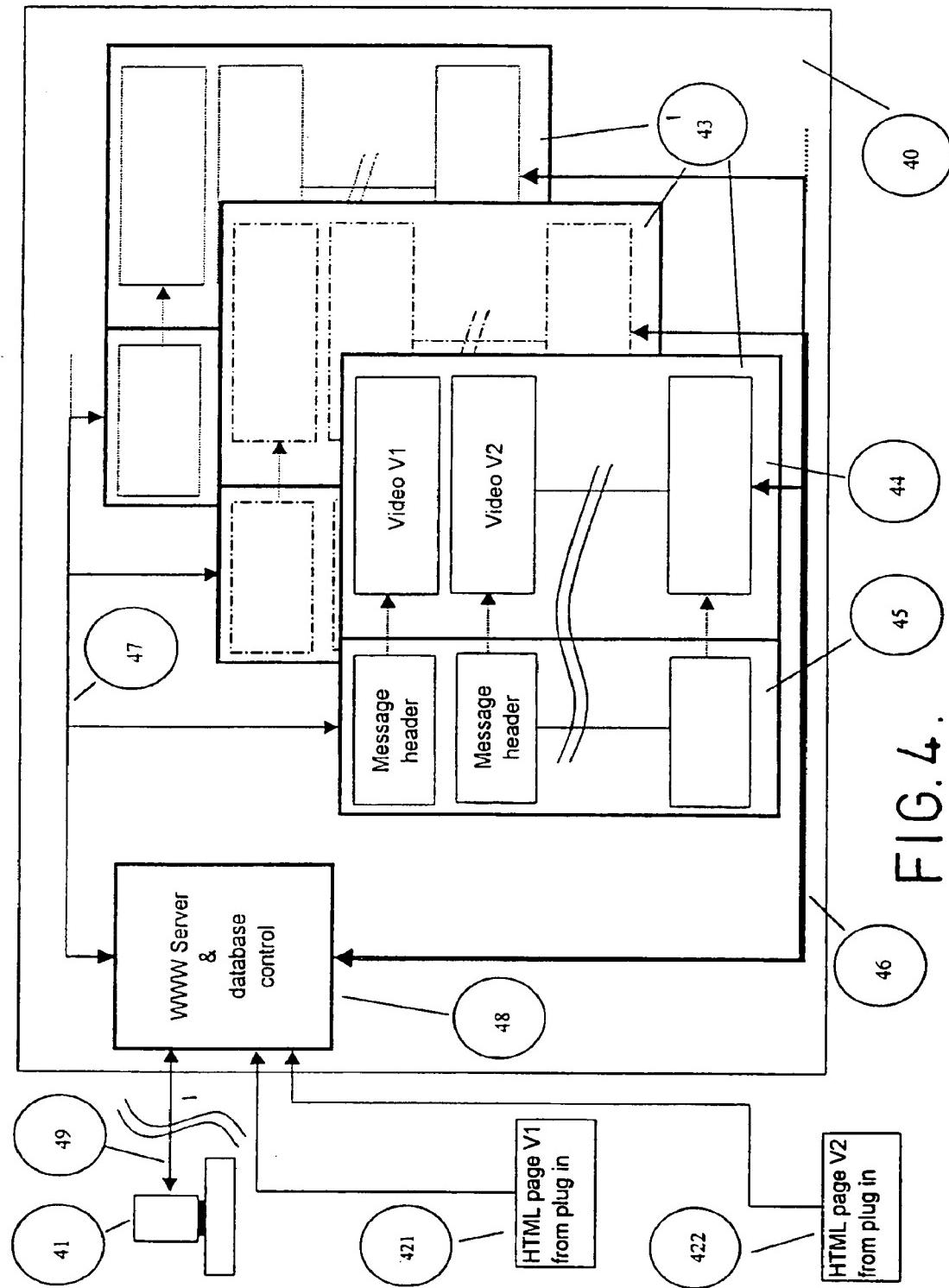


FIG. 4.

Received: from EIDOSUK_WKTSTRH ([172.16.3.10]) by mail.eidos.co.uk with
SMTP

(Microsoft Exchange Internet Mail Service Version 5.5.2448.0)

id 2BC8TQYK; Tue, 6 Apr 1999 10:16:32 +0100

Message-ID: <002f01be800e\$da5ae500\$0a0310ac@eidosuk_wktstrh.eidos.co.uk>

From: Simon Rabé-Hesketh <strh@eidos.co.uk>

Reply-To: Simon Rabe-Hesketh <strh@eidos.co.uk>

To: ASmith@acompany.co.uk

Subject: A message with Video EMail Attachments ?

Date: Tue, 6 Apr 1999 10:21:29 +0100

MIME-Version: 1.0

Content-Type: multipart/mixed;

boundary="----=_NextPart_000_01BE800F.133E6490"

This message is in MIME format. Since your mail reader does not understand
this format, some or all of this message may not be legible.

----=_NextPart_000_01BE800F.133E6490

Content-Type: text/plain;

charset="iso-8859-1"

Mr Smith

This has multiple Video EMail attachments

Hesk.

—
Simon Rabe-Hesketh (strh@eidos.co.uk)

----=_NextPart_000_01BE800F.133E6490

51

52

53

54

55

FIG. 5A.

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____=_NextPart_000_01BE800F.133E6490
Content-Type: video/quicktime; name="CANYON-1.MOV"
Content-Transfer-Encoding: base64
Content-Disposition: attachment; filename="CANYON-1.MOV"

AAAMPW1vb3YAAABsbXZoZAAAAACxeJOhsXiTowAAAlgAACnWAAEAAAAD/AA
AAAAAAAAAAAAAABAAAA
AAAAAAAAAAAAAAAQAAAAAAAAAAAAAAAQAAAAAAAAAAAAAAA
AAAAAAAAAAAAAAA
... [REMOVED DATA]
S0s/BRWgogqdVydXJyd8m5tYImwus1Kqq6r567kvgpmadY8KChZvAQEYegjdq/tX
9Okhx/++Y/pF
UiArICogfXSHnodjp2+nEZabERGmm5o9mxCK+p+9VKAVNzc3Hzc3Hx83Nx8fNzc
fHzc3HzeqqgWq
bm5FVFVIFRVXV1dXV1dXVyftEAAAJs=

____=_NextPart_000_01BE800F.133E6490
Content-Type: video/quicktime; name="CANYON-2.MOV"
Content-Transfer-Encoding: base64
Content-Disposition: attachment; filename="CANYON-2.MOV"

AAAMPW1vb3YAAABsbXZoZAAAAACxeJOhsXiTowAAAlgAACnWAAEAAAAD/AA
AAAAAAAAAAAAAABAAAA
AAAAAAAAAAAAAAAQAAAAAAAAAAAAAAAQAAAAAAAAAAAAAAA
AAAAAAAAAAAAAAA
... [REMOVED DATA]
S0s/BRWgogqdVydXJyd8m5tYImwus1Kqq6r567kvgpmadY8KChZvAQEYegjdq/tX
9Okhx/++Y/pF
UiArICogfXSHnodjp2+nEZabERGmm5o9mxCK+p+9VKAVNzc3Hzc3Hx83Nx8fNzc
fHzc3HzeqqgWq
bm5FVFVIFRVXV1dXV1dXVyftEAAAJs=

____=_NextPart_000_01BE800F.133E6490-

56

57

58

59

50

FIG. 5B.

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```
____=_NextPart_000_01BE800F.133E6490
Content-Type: text/html;
name="canyon_1.html"
Content-Disposition: attachment;
filename="canyon_1.html"

<HTML>
<HEAD>
<TITLE>Title Here</TITLE>
<META http-equiv="refresh" content="1;

URL=http://eidosuk_wktstrh/videomail/VideoMailServlet/message.msg.html?folde
r=INBOX&folder_id=918475864&message_id=14">
</HEAD>
<BODY>
<P>Welcome. This is an Eidos Technologies Ltd. Video Mail Page.</P>
<P>Just a second more...</P>
</BODY>
</HTML>
____=_NextPart_000_01BE800F.133E6490
Content-Type: text/html;
name="canyon_2.html"
Content-Disposition: attachment;
filename="canyon_2.html"

<HTML>
<HEAD>
<TITLE>Title Here</TITLE>
<META http-equiv="refresh" content="1;

URL=http://eidosuk_wktstrh/videomail/VideoMailServlet/message.msg.html?folde
r=INBOX&folder_id=918475864&message_id=14">
</HEAD>
<BODY>
<P>Welcome. This is an Eidos Technologies Ltd. Video Mail Page.</P>
<P>Just a second more...</P>
</BODY>
</HTML>
____=_NextPart_000_01BE800F.133E6490-
```

501

502

503

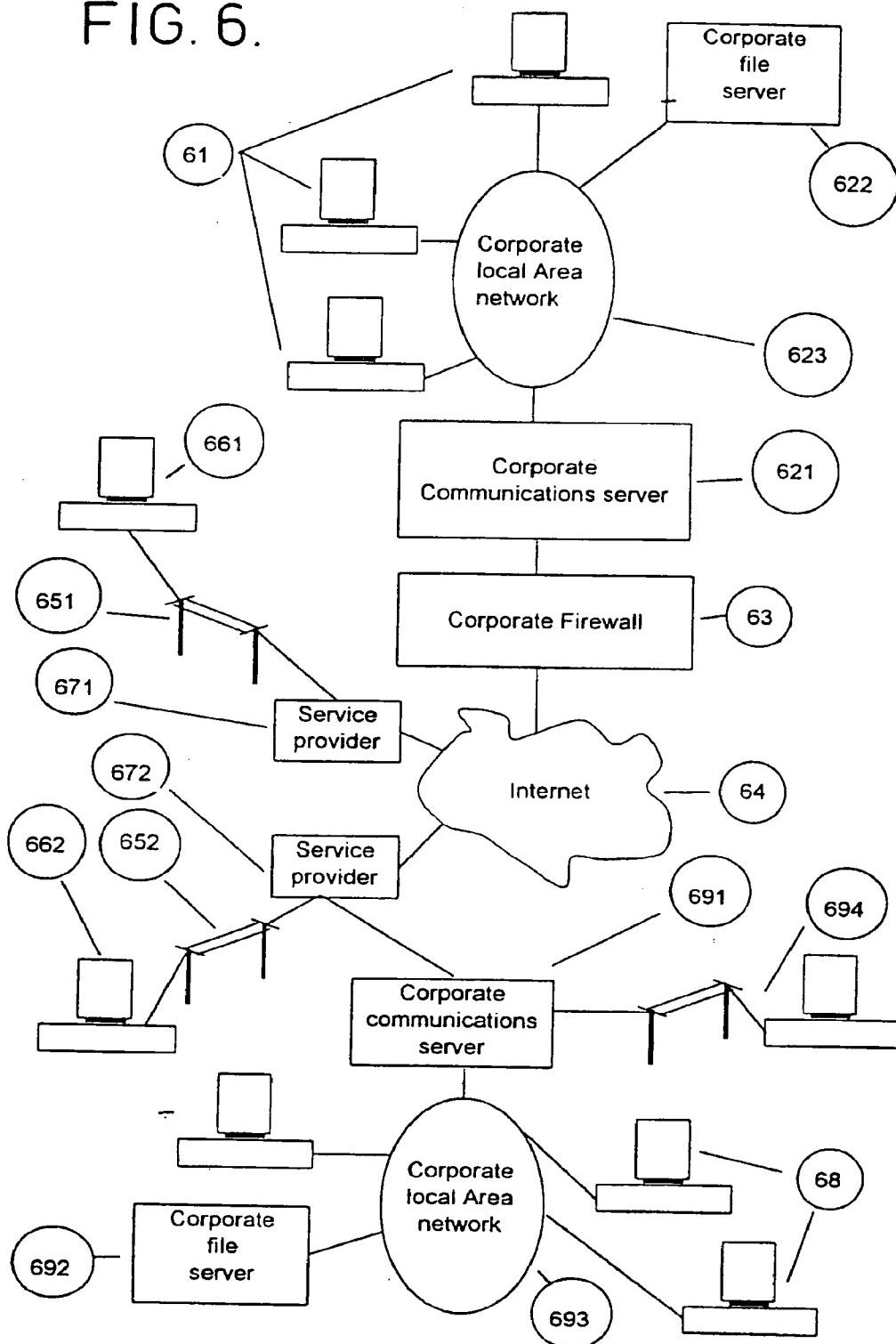
504

505

FIG. 5C.

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FIG. 6.



INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 00/01962

A. CLASSIFICATION OF SUBJECT MATTER
 IPC 7 H04L12/58 H04M3/533

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
 IPC 7 H04L H04M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, PAJ, WPI Data, INSPEC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	<p>EP 0 785 661 A (AT & T CORP) 23 July 1997 (1997-07-23)</p> <p>abstract column 1, line 10 - line 23 column 2, line 19 -column 4, line 50 figure 2</p> <p>---</p> <p>-----</p>	1-6, 14-19, 27,28, 31-35
A		-/-

Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- "&" document member of the same patent family

Date of the actual completion of the international search

20 October 2000

Date of mailing of the international search report

02/11/2000

Name and mailing address of the ISA

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Authorized officer

Poggio, F

INTERNATIONAL SEARCH REPORT

I National Application No

PCT/GB 00/01962

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5 781 901 A (KUZMA ANDREW J) 14 July 1998 (1998-07-14)	1-6, 14-19, 27,28, 31-35
A	abstract column 3, line 31 -column 5, line 65	10-12, 23-25, 39-42
A	EP 0 845 894 A (BOSTON TECH INC) 3 June 1998 (1998-06-03) abstract column 3, line 4 - line 9 column 7, line 42 -column 8, line 54 column 11, line 37 -column 12, line 32 column 19, line 51 -column 20, line 31	1,14,27, 28

INTERNATIONAL SEARCH REPORT

Information on patent family members

national Application No

PCT/GB 00/01962

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US 5781901	A 14-07-1998	NONE			
EP 0845894	A 03-06-1998	CA 2220317 A	JP 10233801 A		05-05-1998 02-09-1998